

Discrete Mathematics

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1 General comments

Sequences are like puzzles. the more you study them the easier it will be to decipher them. There are few clues that might help you.

1. Sequences in which consecutive terms are different by a fixed amount: 1, 5, 9, 13, 17, ...
2. Sequences in which the ratio between consecutive terms is fixed: 2, 6, 18, 54, ...
3. Simple variations: 5, 9, 21, 57, ...
4. A useful technique is to investigate the sequence of differences: 2, 5, 10, 17, 26, ...
5. Occasionally the difference of the differences may shed light on the sequence: 2, 8, 18, 35, 61, ...
6. Usually recursive structure can be detected: 1, 1, 2, 4, 7, 13, 24, ...
7. Then there is the internet! The database of (almost all) sequences.
8. and finally, there are prayers...

2 A small sample of Sequences

Numbers and patterns...

Find the next two terms and the general term of the following sequences:

1. 3, 4, 8, 122, 722, 5042, 40322, ...
2. 3, 17, 55, 129, 251, 433, 687, ...
3. 1, 10, 11, 100, 101, 110, 111, 1000, ...

Prime related sequences:

1. $0, 1, 1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 1, \dots$
2. $1, 2, 2, 3, 2, 4, 2, 4, 3, 4, 2, 6, 2, 4, \dots$
3. $1, 2, 6, 30, 210, 2310, \dots$